Knowing El Niño:

Integrating knowledges of managing climate variability in the eastern Australian rangelands

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BSc (Hons)

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Declaration

This thesis contains no material that has been accepted for the award of any other higher degree or graduate diploma in any tertiary institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person, except when due reference is made in the text of the thesis.

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Abstract

Climate variability in Australia's rangelands leads to large swings in agricultural productivity from year to year. Contemporary policy has framed such variability as a manageable risk and Australian governments have fostered the development of a scientific community to assist farmers and graziers to manage climate risk via models, predictions and various information products. Meanwhile, farmers and graziers make decisions on the basis of diverse forms of information and knowledge. This thesis is a qualitative analysis of the knowledge boundaries among these scientific and lay communities.

I conducted the research in three parts. Firstly, I undertook and analysed 35 in-depth, semi-structured interviews with Australian scientists involved in research, development and extension of climate-related risk management tools. These technologies are based on climate models, which predict the impacts or dynamics of the El Niño Southern Oscillation (ENSO) and other major climatic fluctuations. Many are also reliant on systems models, which link the climate models to particular agricultural and geographic contexts. Secondly, I conducted and analysed interviews with 70 graziers in the semi-arid rangelands of eastern Australia. Thirdly, these two analyses were brought together with a re-constructive goal: to inform institutional practices and foster improved integration of scientific and lay knowledges concerning climate variability and rangeland management.

The discourse analysis focused on matters of epistemological and ontological substance. On the one hand, I investigated *how* climate variability and predictability were constituted by participants. On the other, I analysed *what* these constitutions of climate reveal about participants' positioning with respect to particular knowledge claims, identities, discourse and institutions. Following a detailed discussion about how scientists and graziers constituted climate variability, I conclude by positing that climate knowledges, made mutually by scientists and graziers, become mutually useful. I detail five principles which will

enhance such mutual knowledge production across the relevant domains of research and practice, as follows:

1. Framing the problems associated with managing climate variability needs to be done deliberatively, involving both graziers and scientists.
2. Articulating diverse socio-environmental concerns in addressing problems requires integration of social and biophysical science.
3. Reflexivity and humility should be explicitly emphasised as elements of scientific praxis in this public good science.
4. Scientists should include and closely examine the placed knowledges of lay actors.
5. Integrating extension with research and development will make scientific knowledge-making more effectively targeted and adaptive.

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List of acronyms

ABC	Australian Broadcasting Corporation
ABoM	Australian Bureau of Meteorology
AWI	Australian Wool Innovations
BMRC	Bureau of Meteorology Research Centre
CSIRO	Australia's Commonwealth Scientific and Industrial Research Organisation
DSS	Decision Support System
ENSO	El Nino Southern Oscillation
IPO	Inter-decadal Pacific Oscillation
LWW	Land, Water & Wool, Commonwealth Government and AWI funded research program, a sub-program of which supported this research
MCVP	Managing Climate Variability Program, Commonwealth and RDC funded research program focused on assisting primary producers to manage climate risk
MJO	Madden Julian Oscillation, an intra-seasonal influence Australian rainfall, especially northern Australia
NCC	National Climate Centre, part of the ABoM
NSW Ag	New South Wales Department of Agriculture
QCCA	Queensland Centre for Climate Applications
QDNR&M	Queensland Department of Natural Resources and Mines
QDPI	Queensland Department of Primary Industries
RDC	Research and Development Corporation, primary producer funded organisation which invests in agricultural research
R,D&E	Research Development and Extension
SSK	Sociology of Scientific Knowledge
SST	Sea-surface temperature
STS	Science and Technology Studies
ToT	Transfer of Technology, a top-down agricultural extension model

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This thesis is dedicated to all the scientists and graziers who participated in the research. They have opened my eyes to the possibilities of the rangelands, and what the ways scientists and lay people might eventually collaborate in the production of knowledge. During the fieldwork, some graziers and scientists took me in, fed me, and helped me in various ways, asking little or nothing in return. My thanks go to all of them. Two in particular stand out for their generosity and enthusiasm: Mark Kleinschmidt and Greg McKeon.

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unwaveringly supportive and strategic throughout. It has been a great privilege to work with all these fine scholars.

Family inevitably interferes with the progress of a PhD. A PhD interferes with family too. My mother, Liz, has supported this work in more ways than I can explain. I will always be grateful for Cath's stoicism, which allowed me to complete the fieldwork, and her generosity of spirit by which my dark self-doubts have been thwarted throughout this PhD. Tarn and Chloe, you are my beacons.

Preface

In 1997 I rode a bicycle across the rangelands of Australia, through western New South Wales and South Australia. The country and its denizens got under my skin. The remoteness and enormity of the inland was beyond my expectation and changed the way I thought about being and knowing in this vast land. The quiet bustle of outback lives – of ants, plants, kangaroos, sheep, and those very few people – appeared differently connected, perhaps more so, than was apparent in the relative density of the eastern seaboard. Something else affected my thinking: the seed was planted when an attendant at a service station in a small outback town said to me, in passing, "if the man on the land is happy, everyone out here is happy". It was a comment about climate; more specifically about the inter-linkages between climate and society. The inference was that the seasons go a long way to making the mood of a place. This idea got me thinking about climate and culture; how people live with climate and make sense of it. The urgent concerns about climate change – about mitigation and adaptation – appeared to me unanswerable without first understanding something of how we come to know climate in very personal, social and cultural ways.

Returning home to Tasmania, I was intrigued by the notion that Aboriginal Tasmanians had lived through extreme conditions in the most recent glaciation. I read a variety of archaeological papers and books in which the rudimentary material technologies of the Tasmanian Aborigines were sketched. I started an Honours project, intending to reconstruct the human thermal environments of Tasmania during the Holocene. My undergraduate background in physical geography led me to look at the problem as a biophysical one. However, it was quickly apparent that the palaeo-data were too thin to model human thermal environments of the last glaciation. With time pressing, I decided to use instrumental meteorological data to map contemporary thermal environments. By getting close to a series of biophysical models in this project, I began to understand some of the complexities, uncertainties and limitations that infuse such modelling. I grew more interested in how these abstracted, modelled

worlds could become part of people's lifeworlds. The proliferation of contending models and scientific claims based on them appeared to thwart the authority of such science. As a well-known Australian ecologist, the late Peter Cullen put it: "For every PhD there is an equal and opposite PhD" (Pers. Comm. 2004). In such a setting, I wondered, how do spatial predictions interact with placed reckonings? How do people go about making sense of climate? How is this sense-making informed by diverse outputs of science and technology? Such epistemological questions imply diverse story-lines of proximity and distance, between people, their different forms of knowledge, and their ways of knowing. Such story-lines are followed-up in this thesis. It is itself a story about climate knowledges, risk, uncertainty and place, and how people make sense of the seasons.